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**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Appl. No. : 10/823,953  
Applicant : SIGWORTH  
Filed : April 13, 2004  
Title : COUPLING AGENTS FOR NATURAL FIBER-FILLED  
POLYOLEFINS  
TC/A.U. : 1714  
Examiner: : Thexton, M.  
Docket No. : 0176PA-CIP (UNI164US)

**APPELLANT'S APPEAL BRIEF**

Sir:

The above-identified Appellant submits this Appellant's Appeal Brief pursuant to 37 C.F.R. § 41.37(d). The Notice of Appeal was filed on June 8, 2006.

Please charge the official fee of \$500 for filing a brief in support of an appeal to our Deposit Account Number 23-2656. A duplicate copy of this page is enclosed.

The Appellant relies upon the following authorities and arguments to maintain the appeal.

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**1. Real Party In Interest**

The real party in interest for this matter is the Appellants' assignee. The assignee and real party in interest is Chemtura Corporation, formerly known as Crompton Corporation, Benson Road, Middlebury, Connecticut 06749.

**2. Related Appeals and Interferences**

There are no other appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**3. Status of Claims**

Application No. 10/823,953 was filed on April 13, 2004, and was a continuation-in-part of U.S. Application Number 10/412,981, filed April 14, 2003]. Claims 1 through 15 were originally filed.

In an Office Action of June 9, 2005, claims 1 through 14 were rejected under 35 U.S.C. § 102(b) as being anticipated by Sigworth et al, ("The Use of Functionalized Polyolefins in Environmentally Friendly Plastic Composites, GPEC 2002, February 13-14, 2002, pages1-11.), claims 1 through 14 were rejected under 35 U.S.C. § 103(a) as being obvious over "Epolene Polymers" (publication WA-5E, November 2002, Eastman Chemical Company) taken with evidentiary reference "Epolene Waxes" (publication F-301E, December 1996, Eastmand Chemical Company), claim 15 was rejected under 35 U.S.C. § 103(a) as being obvious over "Epolene Polymers" taken with evidentiary reference "Epolene Waxes" in view of Wolcott et al., (Coupling Agent/Lubricant Interaction in Commercial Wood Plastic

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Formulations, Sixth International Conference on Woodfiber-Plastic Composites, Madison, WI, May 15-16, 2001.), claims 1 through 14 were rejected under 35 U.S.C. § 103(a) as being obvious over Godavarti et al. (U.S. Patent No. 6265037-B1) in view of “Epolene Polymers” taken with evidentiary reference “Epolene Waxes,” and claim 15 was rejected 35 U.S.C. § 103(a) as being obvious over Godavarti et al. (U.S. Patent No. 6265037-B1) in view of “Epolene Polymers” taken with evidentiary reference “Epolene Waxes.”

In a Response of December 8, 2005, Appellant canceled claims 8 and 10, amended claims 1, 5, 6, 7, 9, 14, and 15, and presented arguments which overcame the rejection of claims 1 through 7, 9, and 11 through 15 under 35 U.S.C. § 102(b) as being anticipated by Sigworth et al. (The Use of Functional Polyolefins in Environmentally Friendly Plastic Composite).

In an Office Action of January 9, 2006, the Examiner accepted the arguments presented by the Appellant and withdrew the 35 U.S.C. § 102(b) rejection of claims 1 through 7, 9, and 11 through 15 as being anticipated by Sigworth et al (The Use of Functionalized Polyolefins in Environmentally Friendly Plastic Composites). The Examiner rejected the arguments presented by the Appellant and made final his rejection of claims 1 through 14 were rejected under 35 U.S.C. § 103(a) as being obvious over “Epolene Polymers” (publication WA-5E, November 2002, Eastman Chemical Company) taken with evidentiary reference “Epolene Waxes” (publication F-301E, December 1996, Eastmand Chemical Company), claim 15 was rejected under 35 U.S.C. § 103(a) as being obvious over “Epolene Polymers” taken with evidentiary reference “Epolene Waxes” in view of Wolcott et al., claims 1 through 14 were rejected under 35 U.S.C. § 103(a) as being obvious over Godavarti

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et al. (U.S. Patent No. 6265037-B1) in view of "Epolene Polymers" taken with evidentiary reference "Epolene Waxes," and claim 15 was rejected 35 U.S.C. § 103(a) as being obvious over Godavarti et al. (U.S. Patent No. 6265037-B1) in view of "Epolene Polymers" taken with evidentiary reference "Epolene Waxes."

Appellant filed a Notice of Appeal on June 8, 2006.

**4. Status of Amendments**

All amendments filed in the application have been entered.

**5. Summary of Claimed Subject Matter**

The present invention relates to polyolefin composites comprising natural fibers having increased strength resulting from the inclusion of a functionalized polyolefin coupling agent having broad molecular weight distribution and containing more than 5 mmoles of functionalized monomer per 100 grams of polymer.

The present invention is directed to a process for preparing a composite material comprising mixing together at least one natural fiber, at least one polypropylene resin, and at least one functionalized polypropylene coupling agent to provide the composite material. The coupling agent comprises more than five mmoles of at least one polar monomer per 100 grams of polymer and has a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC). (See specification at para. [0022] and claims 1-7, 9, and 11-13.)

In another aspect, the present invention is directed to a composite material prepared by a process comprising mixing together at least one natural fiber, at least one polypropylene

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resin, and at least one functionalized polypropylene coupling agent to provide said composite material. Said coupling agent comprises more than five mmoles of at least one polar monomer per 100 grams of polymer and has a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC). (See specification at para. [0023] and claim 14.)

In a third aspect, the present invention is directed to a composite material comprising at least one natural fiber, at least one polypropylene resin, at least one functionalized polypropylene coupling agent, and at least one lubricant selected from the group consisting of fatty acid amides and fatty acid esters. The coupling agent comprises more than eight millimoles of at least one polar monomer per 100 grams of polypropylene and has a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC). (See specification at para. [0024] and claim 15.)

**6. Grounds of Rejection to Be Reviewed on Appeal**

Claims 1 through 14 were rejected under 35 U.S.C. § 103(a) as being obvious over “Epolene Polymers” (publication WA-5E, November 2002, Eastman Chemical Company) taken with evidentiary reference “Epolene Waxes” (publication F-301E, December 1996, Eastman Chemical Company), claim 15 was rejected under 35 U.S.C. § 103(a) as being obvious over “Epolene Polymers” taken with evidentiary reference “Epolene Waxes” in view of Wolcott et al., claims 1 through 14 were rejected under 35 U.S.C. § 103(a) as being obvious over Godavarti et al. (U.S. Patent No. 6265037-B1) in view of “Epolene Polymers” taken with evidentiary reference “Epolene Waxes,” and claim 15 was rejected 35 U.S.C. §

103(a) as being obvious over Godavarti et al. (U.S. Patent No. 6265037-B1) in view of “Epolene Polymers” taken with evidentiary reference “Epolene Waxes.”

**7. Argument**

**Examiner’s 35 U.S.C. 112, second paragraph, rejection regarding the use of “polypropylene resin” in claims 7 and 9.**

The Examiner has rejected claims 7 and 9 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out which use of polypropylene resin from claim 1 is claimed. The Applicant believes that amending both claim 7 and 9 by adding the term “base” before “polypropylene resin” would make claims 7 and 9 definite and the Examiner’s 35 U.S.C. 112, second paragraph, rejection moot. This rejection is otherwise traversed and reversal of the rejection is requested.

**Examiner’s 35 U.S.C. 103(a) rejection of claims 1-7, 9, and 11-14 as being unpatentable over “Epolene Polymers” taken with evidentiary reference “Epolene Waxes.”**

The Examiner has rejected claims 1-7, 9, and 11-14 under 35 U.S.C. 103(a) as being unpatentable over “Epolene Polymers” (publication WA-5E, November 2002, Eastman Chemical Company) taken with evidentiary reference “Epolene Waxes” (publication F-301E, December 1996, Eastman Chemical Company). The Examiner cites the maleated polyolefins C-16, C-18, and E-43 in Epolene Polymers in support of the rejection. This rejection is respectfully traversed.

The present invention, as amended, relates to a composite material comprising mixing at least one natural fiber, at least one polypropylene resin, and at least one functionalized

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polypropylene coupling agent to provide the composite material; wherein the functionalized polypropylene coupling agent possesses a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC) and comprises a base polypropylene resin that is grafted with a total of more than about 1 mmole of at least one polar monomer per 100 grams of functionalized polypropylene coupling agent, and a process for preparing the composite material. Applicant has demonstrated the unexpected advantage of using a polypropylene coupling agent which has a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC). See Examples, beginning on page 10 of the specification.

Neither Epolene Polymers nor Epolene Waxes teaches or suggests that a functionalized polypropylene coupling agent that possesses a molecular weight distribution of greater than 2.5, should or could be used in natural fiber composite material. C-16 and C-18 are maleated polyethylenes and E-43 has a MWD of 2.3. Accordingly, the ordinary person skilled in the art would not have been lead to Applicant's claimed invention based on the description in Epolene Polymers or Epolene Waxes, alone or in combination.

Reconsideration of the rejection of claims 1-7, 9, and 11-14 under 35 U.S.C. 103(a), as being unpatentable over Epolene Polymer taken with evidentiary reference Epolene Waxes, is respectfully requested.

**Examiner's 35 U.S.C. 103(a) rejection of claim 15 as unpatentable over "Epolene Polymers" taken with evidentiary reference "Epolene Waxes."**

The Examiner has rejected claim 15 under 35 USC 103(a) as being unpatentable over Epolene Polymers taken with evidentiary reference Epolene Waxes and further in view of Wolcott et al. This rejection is respectfully traversed.

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Applicants' claimed invention in claim 15 relates to a natural fiber composite material comprising at least one polypropylene resin, at least one functionalized polypropylene coupling agent, and at least one lubricant selected from the group consisting of fatty acid amides and fatty acid esters; wherein the functionalized polypropylene coupling agent possesses a molecular weight distribution of greater than 2.5.

The deficiencies of the Epolene Polymers and Epolene Waxes has been discussed above, i.e., neither reference, alone or in combination, teach or suggest that a functionalized polypropylene coupling agent that possesses a molecular weight distribution of greater than 2.5, should or could be used in natural fiber composite material.

Wolcott et al describe the use of certain waxes (Zn-stearate, EBS, OP-100) in certain wood composite materials comprising polypropylene or polyethylene. Wolcott et al do not teach or suggest that a functionalized polypropylene coupling agent that possesses a molecular weight distribution of greater than 2.5, should or could be used in the wood composite material.

Furthermore, the coupling agents useful in Applicant's claimed invention show surprisingly superior performance in lubricated systems. For example, compare the formulation containing the 2% of the coupling agent of this invention and 3% of the fatty acid amide ethylene bis-stearamide (Example 28 in Table 5 of the present specification) with the Wolcott et al sample containing 2% of MA-PP wax and 1% of ethylene bis-stearamide (2nd from bottom in Table 3). Compared to controls that did not contain either coupling agent or lubricant, the sample of the present invention showed a 37% increase in flexural strength versus only a 12% increase for the Wolcott et al sample.



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Accordingly, none of Wolcott et al, Epolene Polymers, or Epolene Waxes teaches or suggests that a functionalized polypropylene coupling agent that possesses a molecular weight distribution of greater than 2.5, should or could be used in lubricated natural fiber composite material. Accordingly, the ordinary person skilled in the art would not have been lead to Applicant's claimed invention based on the descriptions in Wolcott et al, Epolene Polymers or Epolene Waxes, alone or in combination. Reconsideration of the rejection of claim 15 under 35 U.S.C. 103(a) as being unpatentable over Epolene Polymers taken with evidentiary reference Epolene Waxes and further in view of Wolcott et al, is respectfully requested.

**Examiner's 35 U.S.C. 103(a) rejection of claims 1-7, 9, and 11-14 as being unpatentable over Godavarti et al in view of "Epolene Polymers" taken with evidentiary reference "Epolene Waxes."**

The Examiner has rejected claims 1-7, 9, and 11-14 under 35 U.S.C. 103(a) as being unpatentable over Godavarti et al (U.S. 6,265,037 B1) in view of Epolene Polymers taken with evidentiary reference Epolene Waxes. This rejection is respectfully traversed.

Applicant's invention in claims 1-7, 9, and 11-14 has been discussed above. The deficiencies of Epolene Polymers and Epolene Waxes have also been discussed above.

Godavarti et al describe certain polyolefin wood fiber composite materials useful for structural members. Godavarti et al do not teach or suggest that a functionalized polypropylene coupling agent that possesses a molecular weight distribution of greater than 2.5, should or could be used in the wood fiber composite material. The maleated polypropylene coupling agents used in Godavarti et al for which there are MW and functionality data are Epolene E-43, G-3003, and G-3015. E-43 has MWD of 2.3. G-3003 and G-3015 each has a MWD of 1.9.

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Accordingly, none of Godavarti et al, Epolene Polymers, or Epolene Waxes teaches or suggests that a functionalized polypropylene coupling agent that possesses a molecular weight distribution of greater than 2.5, should or could be used in wood fiber composite material. Accordingly, the ordinary person skilled in the art would not have been lead to Applicant's claimed invention based on the descriptions in Godavarti et al, Epolene Polymers or Epolene Waxes, alone or in combination. Reconsideration of the rejection of claims 1-7, 9, and 11-14 under 35 U.S.C. 103(a) as being unpatentable over Godavarti et al in view of Epolene Polymers taken with evidentiary reference Epolene Waxes, is respectfully requested.

**Examiner's 35 U.S.C. 103(a) rejection of claim 15 as unpatentable over Godavarti in view of "Epolene Polymers" taken with evidentiary reference "Epolene Waxes."**

The Examiner has rejected claim 15 under 35 USC 103(a) as being unpatentable over Godavarti et al in view of Epolene Polymers taken with evidentiary reference Epolene Waxes and further in view of Wolcott et al. This rejection is respectfully traversed.

Applicants' invention in claim 15 has been discussed above. The deficiencies of all of the references Godavarti et al, Epolene Polymers, Epolene Waxes, and Wolcott et al, have been discussed above.

None of Godavarti et al, Wolcott et al, Epolene Polymers, or Epolene Waxes teaches or suggests that a functionalized polypropylene coupling agent that possesses a molecular weight distribution of greater than 2.5, should or could be used in lubricated natural fiber composite material. Accordingly, the ordinary person skilled in the art would not have been lead to Applicant's claimed invention based on the descriptions in Godavarti et al, Wolcott et al, Epolene Polymers or Epolene Waxes, alone or in combination. Reconsideration of the

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rejection of claim 15 under 35 U.S.C. 103(a) as being unpatentable over Godavarti et al, in view of Epolene Polymers taken with evidentiary reference Epolene Waxes and further in view of Wolcott et al, is respectfully requested.

**Conclusion**

The Examiner has inappropriately combined the cited references and neither reference alone nor in combination discloses or suggests the present invention. Appellant requests that the rejections of claims 7 and 9 under 35 U.S.C. 112, second paragraph, and the 35 U.S.C. 103(a) rejections be withdrawn, and the application be given favorable consideration.

**8. Claims Appendix**

An appendix is attached that contains a copy of the claims, as amended, that are involved in this appeal.

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**9. Evidence Appendix**

The Appellant does not rely on additional evidence in this appeal.

**10. Related Proceedings Appendix**

The Appellant is unaware of any related proceedings.

Respectfully submitted,

8 August 2006  
Date

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**Claims Appendix**

Listing of Claims:

1. A process for preparing a composite material comprising mixing at least one natural fiber, at least one polypropylene resin, and at least one functionalized polypropylene coupling agent to provide said composite material; wherein said functionalized polypropylene coupling agent possesses a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC) and comprises a base polypropylene resin that is grafted with a total of more than about 1 mmole of at least one polar monomer per 100 grams of functionalized polypropylene coupling agent.
2. The process of claim 1 wherein the natural fiber is selected from the group consisting of wood flour, wood fiber, and agricultural fiber.
3. The process of claim 1 wherein the natural fiber is selected from the group consisting of wood flour, wood fiber, hemp, flax, and kenaf.
4. The process of claim 1 wherein the natural fiber is employed at a level in the range of from about 20 to about 85 weight % based on the total formulation weight of the composite material.
5. The process of claim 1 wherein the base polypropylene resin is grafted with a total of more than about 5 mmole of at least one polar monomer per 100 grams of functionalized polypropylene coupling agent.

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6. The process of claim 1 wherein the base polypropylene resin is grafted with a total of more than about 10 mmole of at least one polar monomer per 100 grams of functionalized polypropylene coupling agent.

7. The process of claim 1 wherein the polypropylene resin is a polypropylene copolymer comprising a major proportion of propylene combined with a minor proportion of a second monomer selected from the group consisting of ethylene and C<sub>4</sub>-C<sub>16</sub> monomer materials.

9. The process of claim 1 wherein the polypropylene resin is polypropylene homopolymer.

11. The process of claim 1 wherein the polar monomer is selected from the group consisting of ethylenically unsaturated carboxylic acids, ethylenically unsaturated carboxylic acid anhydrides, and derivatives of the foregoing.

12. The process of claim 11 wherein the polar monomer is selected from the group consisting of maleic acid, fumaric acid, itaconic acid, crotonic acid, acrylic acid, methacrylic acid, maleic anhydride, itaconic anhydride, substituted maleic anhydrides, and derivatives of the foregoing.

13. The process of claim 1 wherein the polar monomer is maleic anhydride.

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14. A composite material prepared by a process comprising mixing at least one natural fiber, at least one polypropylene resin, and at least one functionalized polypropylene coupling agent to provide said composite material; wherein said functionalized polypropylene coupling agent possesses a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC) and comprises a base polypropylene resin that is grafted with a total of more than about 1 mmole of at least one polar monomer per 100 grams of functionalized polypropylene coupling agent.

15. A composite material comprising at least one natural fiber, at least one polypropylene resin, at least one functionalized polypropylene coupling agent, and at least one lubricant selected from the group consisting of fatty acid amides and fatty acid esters; wherein said functionalized polypropylene coupling agent possesses a molecular weight distribution of greater than 2.5 ( $M_w/M_n$  by GPC) and comprises a base polypropylene resin that is grafted with a total of more than about 1 mmole of at least one polar monomer per 100 grams of functionalized polypropylene coupling agent.

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**Evidence Appendix**

The Appellant does not submit any further evidence pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132.



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**Related Proceedings Appendix**

No decisions rendered by a court or the Board in any proceeding identified pursuant to 37 C.F.R § 41.38(c)(1)(ii) are known to the Appellant.